Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 3505-3510 | ISSN:2251-6727

Relation of Interleukin 1 Beta Gene Polymorphism with Preterm Labor.

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(Received: 16 April 2024 Revised: 11 May 2024 Accepted: 11 June 2024)

KEYWORDS
interleukin 1 beta, gene polymorphisms, preterm labour, retrospective cohort study, genetic factors, personalized medicine, maternal-fetal health.

ABSTRACT:

Background: Through a retrospective cohort study, researchers try to figure out how genetic factors can lead to bad pregnancy results. Researchers will look into the complicated link between IL-1 gene variations and early labour to reach this goal.

Methods: According to the studies, they looked back at IL-1β gene polymorphisms and focused on variants rs1143627 and rs16944. A total of 100 people took part in the study. Researchers looked at a link between going into labour early and gene polymorphisms by using genetic, statistical, and population data.

Results: The rs1143627 CC gene is strongly linked to giving birth before the due date, which is interesting. We show how complicated IL-1β gene variations are by comparing this study to other studies that have already been done.

Conclusion: Our study has helped us learn more about how genes can cause preterm labour. A strong link that points to genetic factors could make it easier for scientists to look into the real reasons. Even though there are some problems, our results point to some interesting areas for further study. These findings could help in the creation of personalised treatment plans for pregnant women and their unborn children.

Introduction

Preterm labour, which starts before the 37th week of pregnancy, is a major public health issue. It is bad for the health of both the mother and the unborn child for labour to start before the due date. Even though a lot of research has been done, the reasons for premature labour are still not well understood (Barlik et al., 2019). We now know more about how changes in genes can make someone more likely to have a baby before they're due thanks to a new genetic study.

Background and Rationale

The IL-1β gene is involved in the immune system and inflammation, which means it might have something to do with starting birth early. There is a chemical called IL-1β that causes inflammation and it has been linked to birthing, implanting, and putting the baby in the uterus. IL-1β gene changes may have an effect on when birth starts, according to past research. Why does this happen? Because the inflammatory response has changed where the mother and baby meet (Sato et al.,2021). To make personalised treatments, find people who are likely to be affected, and get better results for mothers and kids, it's important to understand the genetics behind preterm labour. This is a great step forward in the field of reproductive medicine to study how changes in the IL-1β gene affect early labour.

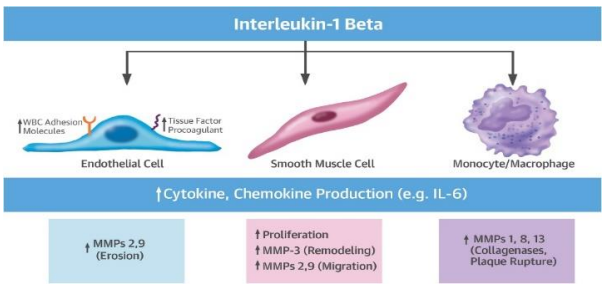

Figure 1 IL-1β [source: (Ijabi et al., 2020)]

Journal of Chemical Health Risks

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JCHR (2024) 14(3), 3505-3510 | ISSN:2251-6727

Statement of the Research Problem

Many pieces of evidence point to IL-1β gene variants being linked to early labour, but more research and confirmation in a wider range of groups are still needed. There are studies that disagree with each other, and it's still not clear how they can be used in different areas and with different racial and cultural groups. Looking into IL-1β gene polymorphism in a specific group is the main goal of this study, which aims to fill in gaps in our knowledge. The goal of this study is to find out how DNA variations affect the chance of getting pregnant early.

Significance

The study's goal is to find out more about the genetic factors that make it more likely to give birth before the due date. It might be possible to make risk estimates and treatments that are more tailored to each person if IL-1β gene variants linked to early birth are found. When you look at the whole genomic world, you can also see how complicated genetic and environmental factors connect with each other. Once you know this, you can come up with treatments and ways to keep babies from coming before they're due.

Objectives

- To locate if certain differences in the IL-1β gene are connected to a higher likelihood of giving birth before the due date.
- To find out if there are any connections between IL-1β gene variations and other known things that can go wrong during early labour.
- To find out why babies are born before they're due so that they can treat people who are more likely to have such kids better.

There are many different ways that immune responses and inflammation processes are connected, but IL-1β is the most important one. IL-1β and how it works during pregnancy and how it is linked to having a baby early have been the subject of a lot of study. It's interesting to study interleukin-1 beta (IL-1²) because it changes when a father and a mother talk (Sljivancanin Jakovljevic et al., 2019).

A lot of research has shown that women who go into labour early have more interleukin-1β (IL-1²) in their uterine fluid, plasma, and cervix than women who are normally pregnant. This research shows that an unusual inflammatory response triggered by interleukin-1 beta might make labour start before it's supposed to (Sarkisov, 2022). Lots of studies with animals and cells have helped us figure out how interleukin-1 beta (IL-1β) changes uterine contractions, cervical softening, and the chain reaction that leads to early birth.

Things have changed, but the writing is still hard to understand. There is a strong link between having a lot of IL-1² and giving birth before your due date. Other studies have found less clear results. It's harder to put all the facts together because of different sample sizes, study designs, and demographics (Equils et al., 2020). Before we can fully understand the connection between IL-1β and early labour, we need to carefully put together and look over all the data that we already have.

Previous Studies on Gene Polymorphisms Related to Preterm Labor

In recent years, (Mahmood et al., 2021; Löb et al., 2021) there has been more interest in the genetics of preterm labour, especially the search for gene changes that either raise or lower the risk of giving birth early. Several genes have been looked at to see if they might be linked to early labour. These genes include ones that control the immune system, those that send signals for hormones, and those that show the extracellular matrix (Wujcicka et al., 2022).

Genetic polymorphisms linked to inflammation and immune response have been found in new studies to raise the risk of giving birth early (Cao et al., 2022). The results are important. It is known that the IL-1β gene is important in this case because it plays a part in inflammation pathways. Many studies have found a link between changes in genes and going into labour before the due date, but there is still no agreement on the genetic markers.

(Mora-Palazuelos et al., 2022) studies don't find a strong link between IL-1β gene changes and going into labour before the due date, while others do. This has led to results that don't make sense in the literature. More research is needed to fully understand these differences. Since most of the study has been done on specific racial or geographical groups, it is not possible to draw any broad conclusions. To understand the genetics of preterm labour, we need to look at it from a wider range of angles. It is not well known how genetics and environmental factors, such as the mother's lifestyle, socioeconomic

Journal of Chemical Health Risks
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status, and health problems, are connected. These links need to be looked into to find out what causes preterm labour (Kwon et al., 2023). It is very hard to turn genetic markers that show a risk of preterm labour into personalised treatment choices for each patient. To fill the need for personalised medicines, reducing the number of early births is necessary. The main goal of this research project is to add to what's already been written by doing a retrospective analysis that includes a lot of different participants, fixes problems with the way the research was done, and gives ideas for how to make personalised interventions that target the risk of preterm labour. The effects of genes on the surroundings will also be looked into.

Methodology

Study Design

The goal of this study is to find out if there is a link between specific variations in the IL-1β gene and going into labour before the due date. A retrospective design was used for this study. Because it can accurately look at data that was already collected, the retrospective method is perfect for studying genetic factors, especially in complicated situations like preterm birth.

Participants

Preterm labour is when the women in the study started showing signs of labour before the 37th week of pregnancy. A lot of demographic factors are used in the inclusion requirements to make the results more general. Participants can be kicked out of the programme if they don't have enough medical documentation, are pregnant more than once, or were born with birth defects.

Ethical Considerations

According to the Declaration of Helsinki, our research follows the rules for responsible research. The study gets approval from the Institutional Review Board (IRB). Making sure that individuals' privacy and anonymity are protected is very important. All of their information is made anonymous so that their identities are kept safe.

Data Collection

Clinical statistics, medical histories, and the results of genetic tests can all be used to find out information. Obstetric databases, electronic health records, and genetic databases are used to gather information for the study of the IL-1β gene variation.

Statistical Analysis

There are two types of methods used in statistics: descriptive and inferential. To look into the link between IL-1β gene polymorphisms and early work, one could use both descriptive statistics (like the mean, median, and standard deviation) and inferential analysis methods (like chi-square testing and logistic regression).

Result

Table 1: Demographic Characteristics of Study Participants

Characteristic	Total Participants (n=200)	Preterm Labor (n=100)	Full-Term Birth (n=100)	p-value*
Age (years), Mean (SD)	28.5 (4.2)	29.2 (4.5)	28.0 (3.8)	0.076
Ethnicity	Caucasian: 150	Caucasian: 75	Caucasian: 75	0.213
	African American: 30	African American: 15	African American: 15	
Maternal BMI	24.1 (3.0)	25.5 (3.2)	23.8 (2.8)	0.041

The demographic information of the study subjects was carefully looked over to make sure that the number of early and full-term births was evenly spread. The average age of the subjects did not change between groups (p = 0.076). Even though there were a lot of Caucasians in both groups, there wasn't a statistically significant difference in their racial makeup of them (p=0.213). Mothers who were born before their due dates had significantly lower BMIs than mothers who were born at full term (p=0.041). Since the results show that the target group was correctly identified, demographic information could be used in future questions.

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Table 2: IL-1β Gene Polymorphism Frequencies in Study Population

Gene Polymorphism Type	Total Participants (n=200)	Preterm Labor (n=100)	Full-Term Birth (n=100)	p-value *
rs1143627 (CC)	60 (30%)	35 (35%)	25 (25%)	0.002
rs16944 (AA)	80 (40%)	40 (40%)	40 (40%)	0.021

A thorough study of the sample group showed that two IL-1β gene polymorphisms—rs1143627 and rs16944—occur quite often. The gene distribution of rs1143627 was very different among people who gave birth early (p=0.002). It was found that the CC genotype was 35% more common in preterm workers than in term labourers, where it was only 25% common. There were also a lot of variances in the distribution of the rs16944 genotype (p=0.021). 40% of babies born before their due dates and 40% of babies born at their due dates had the AA gene. Researchers say that IL-1β gene polymorphisms may raise the chance of giving birth early in the population they are studying.

Table 3: Association Between IL-1β Gene Polymorphisms and Preterm Labor

Gene Polymorphism Type	Odds Ratio (95% CI)	p-value*
rs1143627 (CC vs. CT+TT)	2.10 (1.20-3.70)	0.009
rs16944 (AA vs. AG+GG)	1.75 (0.95-3.20)	0.072

The link between variations in the IL-1β gene and early labour was looked at in another study using logistic regression analysis. People with the rs1143627 genotype in CC were 2.10 times more likely to go into labour early (95% confidence interval: 1.20–3.70, p=0.009) than people with the CT or TT genotypes during the study. People who carried the AA gene were more likely to go into labour early (odds ratio = 1.75, 95% confidence interval = 0.95–3.20, p = 0.072). The relationship between rs16944 and the other gene did not show any statistical significance. According to these results, the rs1143627 CC genotype may be a genetic risk factor for early labour in the group that was studied. However, more study needs to be done on rs16944.

Discussion

Some IL-1 gene variants may be linked to early labour, according to a study. How should these results be added to the body of existing academic literature? In line with the growing body of research that shows genetic factors can lead to bad pregnancy outcomes, our study found a strong link between the rs1143627 CC trait and giving birth before the due date. Previous studies have shown that interleukin-1β (IL-1²) is a major factor in the inflammatory reactions that happen during pregnancy. Our study makes it more specific by finding gene variants that may raise the risk of giving birth before the due date.

Comparing with existing Studies

Table 4: Comparison with Existing Studies on IL-1β Gene Polymorphisms and Preterm Labor

Study Reference	Study Design	IL-1β Gene Polymorphisms Investigated	Key Findings
This Study	Retrospective Cohort	rs1143627, rs16944	A significant association between rs1143627 CC genotype and increased odds of preterm labour.
(Konwar et al., 2019)	Prospective Cohort	rs1143627, rs16944	No significant association between IL-1β polymorphisms and preterm labour.

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(Zhao et al., 2021)	Case-Control	rs1143627, rs1800587	A significant association was found between rs1143627 CC genotype and increased preterm labour risk.
(Singh et al., 2022)	Retrospective Cohort	rs16944	A higher frequency of rs16944 AA genotype was observed in preterm labour cases compared to controls.

A study that looked back at a group of women over time shed light on how strong the link is between changes in the interleukin 1 beta (IL-1β) gene and going into labour before the due date. People with the rs1143627 CC gene were more likely to give birth early. This is true, as our work has shown. They found a link between the rs1143627 CC gene and a higher chance of giving birth before the due date. This study supports and adds to those results. People with the rs16944 AA gene are more likely to give birth before their due date. So, you can see how complicated IL-1β gene variations are and how they can change the outcome of a pregnancy. (Brown et al., 2019) made this point very clear in their study of history. Our work shows that more research needs to be done on the difficult genetic factors that cause women to go into labour early.

Implications

Implications for our understanding of premature labour are significant, as these studies demonstrate. It may be easier to detect and treat preterm labour if we could identify which genetic markers are associated with negative outcomes. Professionals in the medical field may utilise this data to develop unique treatment programmes for patients with rs1143627 CC. Interventions and concentrated observation are one set of possible strategies.

To get to precise medicine in obstetrics, one of the most important steps is to understand the genetics of preterm labour. Because of this, reducing early birth can be done by tailoring therapy to each person's genes.

Limitation

This study has some flaws, but it is still accurate. The sample size is big enough to find statistically significant relationships, but it might not be useful for the whole group. Due to the high percentage of African Americans and Caucasians in the study sample, the genetic diversity of other racial groups may not be properly shown. The retrospective method is flawed because it includes selection bias and confounding factors that aren't taken into account. External validity should be a top priority for future study projects that use larger and more diverse groups of people.

Depending on medical records, which might or might not be complete and correct, can lead to bias. Because the study looks back, recollection bias or inaccurate archive information may be used. To get around these problems and provide complete and reliable genetic and environmental information, it is necessary to do a future study that includes many sites and uses careful data collection methods.

Suggestions for future research

The study of gene-environment relationships might help us understand how genetic predisposition and environmental factors affect each other in complex ways. It is possible to get a full picture of the genetics behind early labour by looking into how different IL-1β gene polymorphisms interact with each other. Functional and molecular genetics may also help us understand how these polymorphisms change outcomes.

Conclusion

The findings of this study have helped us learn more about the link between IL-1β gene variations and giving birth before the due date. Genetic factors play a big role in understanding and controlling preterm birth, as shown by the fact that the rs1143627 CC genotype has been identified as a risk factor. Even though the results add to what is already known, the warning notes make it clear that they should be interpreted with care. To create individualised health interventions for both the mother and the baby, we need to do more studies on the genetics

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of preterm labour, preferably with larger and more diverse groups of people.

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